

WHAT IS CLAIMED IS:

1 1. An optical waveguide device, comprising:
2 a substrate;
3 at least one optical waveguide disposed in said substrate;
4 a first conductive thin film layer placed in the vicinity of
5 or on the top of said optical waveguide in said substrate and
6 containing an oxide; and
7 a second conductive thin film layer laminated on said first
8 thin film layer and exhibiting acidic or neutral characteristics
9 in its oxidized condition.

1 2. An optical waveguide device as claimed in claim 1,
2 wherein:
3 said first thin film layer contains an indium oxide (ITO).

1 3. An optical waveguide device as claimed in claim 1,
2 wherein:
3 said second thin film layer contains chromium.

1 4. An optical waveguide device as claimed in claim 1,
2 wherein:
3 a protective film is formed on at least one exposed surface
4 of each of said first thin film layer and said second thin film
5 layer.

1 5. An optical waveguide device as claimed in claim 1,
2 wherein:

3 a third conductive thin film layer exhibiting neutral
4 characteristics is formed on the surface of said second thin film
5 layer.

1 6. An optical waveguide device as claimed in claim 5,
2 wherein:

3 said third thin film layer contains gold.

1 7. An optical waveguide device as claimed in claim 1,
2 wherein:

3 a protective film is formed over the whole exposed surface
4 of an electrode composed of said first thin film layer, said second
5 thin film layer, and said third thin film layer.

1 8. An optical waveguide device as claimed in claim 1,
2 wherein:

3 said substrate is fabricated from a lithium niobate (LiNbO_3)
4 substrate;

5 said optical waveguide is disposed on said lithium niobate
6 substrate in such a manner that two Mach-Zehnder type directional
7 couplers are formed, and further a phase shifter is formed in
8 between these directional couplers; and

9 said phase shifter is provided with an electrode of a structure
10 containing said first thin film layer and said second thin film
11 layer, whereby an electric field produced in response to a voltage
12 applied to said electrode is given to said optical waveguide to
13 function as a variable optical attenuator.

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1 9. An optical waveguide device as claimed in claim 1,
2 wherein:
3 said second thin film layer is provided with a third conductive
4 thin film layer laminated thereon and exhibiting neutral
5 characteristics in its oxidized condition.

1 10. An optical waveguide device as claimed in claim 1,
2 wherein:
3 said first thin film layer is a thin film layer of indium oxide
4 to which tin has been added (ITO); and
5 said second thin film layer is a chromium thin film layer.

1 11. An optical waveguide device as claimed in claim 9,
2 wherein:
3 said third thin film layer is a gold thin film layer.

1 12. A process for the production of an optical waveguide
2 device, comprising the steps of:
3 forming at least one optical waveguide in an LN (lithium
4 niobate) substrate;
5 forming an ITO film on said optical waveguide and the surface
6 of said LN substrate;
7 forming a photoresist on said ITO film to conduct a patterning
8 operation;
9 removing unnecessary portions of said ITO film by means of
10 etching with use of said photoresist as a mask to form the ITO
11 pattern;
12 removing the photoresist on said ITO pattern;

13 forming a chromium thin film having a thinner film thickness
14 than that of said ITO film on the surface of said ITO pattern and
15 an exposed surface of said substrate;
16 applying a photoresist on said chromium thin film;
17 removing unnecessary portions of said chromium thin film by
18 means of etching; and
19 removing the photoresist remained on said chromium thin film
20 after said etching.

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